Claims

[c1]   A method of providing associated shapes of an optical lithography mask in relation to predetermined main shapes of the mask, comprising:
generating simplified layout patterns from the predetermined main shapes of the mask by:
eliminating detail of the main shapes which leads to un-manufacturable associated shapes while preserving geometrically relevant shape information; and
generating associated shapes relative to the simplified mask patterns.

[c2]   The method according to claim 1 wherein said associated shapes include sub resolution assist features (SRAFs).

[c3]   The method according to claim 1 wherein said associated features includes fill shapes.

[c4]   The method according to claim 1 wherein said simplified layout patterns are generated through geometric manipulation.

[c5]   The method according to claim 1 wherein said simplified layout patterns are generated mathematically through

application of rules.

[c6] The method according to claim 4 wherein said rules provide for removal of indentations having one or more edges smaller than a predetermined dimension.

[c7] The method according to claim 4 wherein said rules provide for removal of protrusions having one or more edges smaller than a predetermined dimension.

[c8] The method according to claim 2 wherein said simplified layout patterns of the main shapes are generated to maximize coverage of the main features by said associated shapes on the mask.

[c9] The method according to claim 8 wherein said coverage of the main shapes by the associated shapes is maximized according to the product of the number of assisted edges of the main shapes and the length of the assisted edges of the main shapes.

[c10] The method according to claim 4 wherein said simplified layout patterns are generated by, for each of the predetermined main shapes:
defining a quantity X based on the critical dimension of the shape and the lithographic process;
shrinking from every side by a quantity X at least once;
growing on every side by the quantity X at least once;

preserving a common region between the predetermined main shape and the resulting shape after said shrinking and said growing; and, if any feature smaller than said quantity X remains,

reducing the quantity X and repeating said shrinking, said growing, and said preserving said common region until no feature smaller than said quantity X remains.

[c11]   The method according to claim 10 wherein said shrinking is performed at least once prior to said growing.

[c12]   The method according to claim 10 wherein said growing is performed at least once prior to said shrinking.

[c13]   The method according to claim 10 wherein said reducing reduces said quantity X by a given fraction.

[c14]   The method according to claim 4 wherein, for each of the predetermined main shapes, said simplified layout patterns are generated by:

defining a quantity X based on the critical dimension of the shape and the lithographic process;

shrinking from every side by a quantity X at least once;

growing on every side by the quantity X at least once;

preserving a common region between the predetermined main shape and the resulting shape after said shrinking and said growing;

defining a quantity Y based on the critical dimension of the shape and the lithographic process;

growing from every side by a quantity Y at least once;

shrinking on every side by the quantity Y at least once; and

preserving a common region between the predetermined main shape and the resulting shape after said growing and said shrinking.

[c15]   The method according to claim 14 wherein X and Y are not equal.

[c16]   The method according to claim 10 wherein said geometric manipulation is performed in order of shrinking said predetermined main shape by X, growing the result of said shrinking by X, growing again the result of said growing by X, and shrinking again the result of said growing again by X.

[c17]   The method according to claim 10 wherein said geometric manipulation is performed in order of growing said predetermined main shape by X, shrinking the result of said growing by X, shrinking again the result of said shrinking by X, and growing again the result of said shrinking again by X.

[c18]   A method of providing associated shapes of an optical

lithography mask in relation to predetermined main shapes of the mask, comprising:

generating simplified layout patterns from the predetermined main shapes of the mask by, for each of the predetermined main shapes:

defining a quantity X based on the critical dimension of the shape and the lithographic process;

shrinking from every side by a quantity X at least once;

growing on every side by the quantity X at least once;

preserving a common region between the predetermined main shape and the resulting shape after said shrinking and said growing; and, if any feature smaller than said quantity X remains,

reducing the quantity X and repeating said shrinking, said growing, and said preserving said common region until no feature smaller than said quantity X remains; and

generating associated shapes relative to the simplified mask patterns.

[c19] A recording medium recording a set of machine-readable instructions thereon for performing a method of providing associated shapes of an optical lithography mask in relation to predetermined main shapes of the mask, the method comprising:

generating simplified layout patterns from the predeter-

mined main shapes of the mask by eliminating detail of the main shapes which leads to unmanufacturable associated shapes while preserving geometrically relevant shape information; and

generating associated shapes relative to the simplified mask patterns.

[c20] The recording medium according to claim 19 wherein said method further comprises, for each of the predetermined main shapes:

defining a quantity X based on the critical dimension of the shape and the lithographic process;

shrinking from every side by a quantity X at least once;

growing on every side by the quantity X at least once;

preserving a common region between the predetermined main shape and the resulting shape after said shrinking and said growing; and, if any feature smaller than said quantity X remains,

reducing the quantity X and repeating said shrinking, said growing, and said preserving said common region until no feature smaller than said quantity X remains.